LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Insectivorous Water-plant from Trinidad.

SPECIMENS of the carnivorous water-plant from the Trinidad Pitch Lake, referred to in the note on p. 230, have been received at Kew from Mr. Hart. It is not, however, as supposed, "a species of Nitella," which is an aquatic cryptogam, but a flowering plant, and a species of Utricularia.

The habits of these plants are fully discussed in Mr. Darwin's "Insectivorous Plants."

W. T. THISELTON-DYER.

Kew, January 5.

The Maximum Number of Double Points on a Surface.

IT is obvious that a surface, like a curve, must have a maximum number of double points; and it is also obvious that all of them may be *conic nodes*, but only a limited number of them can be *binodes*; but so far as I have been able to discover, no formula has been obtained for determining the maximum number. In Hudson's book on "Kummer's Surface," a proof is given that a quartic surface can have as many as sixteen conic nodes, but no general theorem is alluded to. I shall therefore state a formula by means of which the maximum number can be calculated.

Let a surface of degree n and class m have C isolated conic nodes. Let $\bar{\iota}$ and ι be the number of double and stationary tangents possessed by any plane section of a tangent cone the vertex of which is an arbitrary point. Then it is not difficult to show that

$$m = n(n-1)^2 - 2C \qquad (1)$$

$$\iota = 4n(n-1)(n-2) - 6C \qquad (2)$$

$$2\bar{\iota} = \{2C - n(n-1)^2 + 5\}^2 - \{n(n-1)(3n-14) + 25\} \qquad (3)$$

Now ι and $\bar{\iota}$ must be zero or positive integers; also m must be a positive integer which does not fall below a certain limit, and these conditions will in general be satisfied by taking

$$2C - n(n-1)^2 + 5 = \pm k,$$

where k is the least odd integer the square of which is not less than $n(n-1)(3n-14)+25$. The sign of k must be determined from the above mentioned conditions, and should the least value of k fail to satisfy them a greater one must be taken.

A. B. BASSET.

January 2.

Sounding Stones.

MANY hard and compact varieties of rock are sonorous when struck. Flint nodules often possess this property. The purity of the tone appears dependent upon the length, calibre, and homogeneity of the nodule, the best results being obtained from the long and slender forms. At Studland Bay I have collected many of these "musical" flints, and obtained one from a chalk pit near Faversham which can be used as a gong when suspended. This particular specimen is nearly 2 feet in length (it was once longer), and is scarcely as thick as a rolling-pin!

Many years ago I saw a "rock harmonicon" in the museum at Keswick. It was formed of strips of rock (known as "clinkstones") arranged on the principle of the dulcimer, upon which various tunes could be played.

The phonolite of the Wolf Rock, nine miles south of the Land's End, possesses sonorous properties, and Sir Wyville Thomson has described St. Michael's Mount, an island near Fernando Noronha, as being entirely formed of phonolite which "literally rings like a bell" on being struck.

In quarrying the rock from the Whit Bed, at Portland, the workmen profess to be able to judge of the quality of the limestone by the clearness of the metallic ring emitted from the blocks on being struck.

January 5. CECIL CARUS-WILSON.

Heat a Mode of Motion.

THROUGHOUT Swedenborg's "Principia," published in 1733, both heat and light are constantly regarded as ethereal undulations. The definitions of heat as a rotary movement of minute ether particles will be found in part iii., chapter v., No. 21; chapter vii., No. 10; chapter viii., Nos. 8, 9, 10, 16.

The following is from the "Principia," part iii., chapter vii.:—

"Whatever the ether presents to our organs by means of colours, the air presents to us by means of modulations and sounds. Thus Nature is always the same, always similar to herself, both in light, and in sound, in the eye and in the ear; the only difference is that in one she is quicker and more subtle, in the other slower and crasser."

Although this is not an example from the seventeenth century, it anticipates the theories of Rumford and Young as to light and heat by some sixty years.

CHARLES E. BENHAM.

Colchester, December 23, 1905.

The Naming of Colours.

PERHAPS some of your readers would be interested in, and could suggest some explanation of, the following rather fanciful colour term. A light purple, almost a mauve, is called by the Chinese 雪 (süt$_0$) 青 (Ts'eng), 色 (shik,) "snow green colour." I have asked many educated Chinese for some explanation of the name, but the best I can get is the Chinese are very "fanciful" in the use of colour terms. I may say that the term I have translated "green" is sometimes applied by the Chinese to the colour of the sky.

ALFRED H. CROOK.

Queen's College, Hong Kong, December 2, 1905.

Aurora of November 15.

THE aurora of November 15, 1905, was seen at Szczawnica, in Galicia (Karpathian Mountains), by the meteorological observer Mr. Wojakowski at 9h. p.m. M.E.T.

The day of November 15 and the subsequent night were in Galicia cloudy and rainy. Probably the sky was clear for a while at Szczawnica. The altitude of Szczawnica is 484 metres; longitude, 20° 30′ E. of Greenwich; latitude, 49° 26′ N.

M. P. RUDZKI.

K.K. Sternwarte, Krakau, January 1.

Ascent of Sap in Trees.

WITH reference to an article on the above subject which appeared in your issue of October 26, 1905, the following extract from a paper—which your contributor has doubtless not seen, published nearly ten years ago—will probably interest some of your readers.

FRANK HARRIS.

Maryland, Saundersfoot, December 25, 1905.

EXTRACT FROM *Indian Engineering*, FEBRUARY 8, 1896.

Ascent of Sap in Trees.

Among the various theories which have been advanced to explain the circulation of sap in plants, those dependent on purely mechanical principles are, as has been pointed out, entirely untenable. That hypothesis which relies solely on the osmotic action of the root hairs, though adequate in itself to account for the rise of water to almost any extent, is not compatible with the so-called "negative" pressure observed to exist in the vessels of living timber. The last mentioned among the explanations to which allusion has been made—that which invokes the aid of what may be loosely described as the vital principle—though unobjectionable in itself, unnecessarily complicates

the question; and while some of the difficulties which present themselves upon detailed examination may be overcome, others are less easily surmounted. In the trunk of a tree it is only the cambium itself which can properly be regarded as consisting of living cells—if we use the expression in its usual sense. Besides protoplasm the cambium cell contains a nucleus, and splitting up to form the growing wood is evidently and unquestionably a living cell. The sap cannot, however, be considered as entirely rising through the cambium alone; while the medullary rays and wood-parenchyma, although they both contain protoplasm or such like organic substances, are in no other respects like living tissue. They may be regarded simply as store houses containing nutritive matter, or as actively engaged in the plant's circulation, or as acting in both capacities; but scarcely can they be described as centres of vitality.

The theory which most readily commends itself to our ideas of probability is that which regards osmosis as the primary and all potent cause of the sap's ascent in plants; not taking place in the root alone, as was supposed by those who advocated the earlier theory, but active throughout the whole height of every tree. Concerning osmosis itself it is well to remember that the phenomenon contains nothing transcendental or beyond the reach of ordinary molecular physics for its complete explanation. We know that the particles of a liquid, though far from possessing that mobility which in a gas is due to the great extent of free path enjoyed by its molecules, are constantly in a state of translational motion with regard to each other. The phenomenon of diffusion in inorganic solutions obviously suggests the conclusion that this capacity depends largely upon the relative simplicity which characterises the molecule's construction. Especially is this idea forced upon us when considering the relative diffusibility of various solutions. Here we find the rate of diffusion bearing a definite relation to the solution density; the square of the time of equal diffusion being in the case of such solutions equal to their solution density. It would appear, apart from all questions of chemical combination, that each molecule—or perhaps group of molecules—of the solvent becomes attached to a certain number of molecules of the dissolved substance; this complex group holding together so far as diffusion and osmosis are concerned. Under such circumstances it is only to be expected that the rate of diffusion, which means the passage through intermolecular fluid spaces, or of osmosis, which consists in the passage through interstitial spaces in a porous solid, should vary quite as much as is observed to be the case.

It is true the relatively small differences in the rate of passage through porous bodies observable when inorganic solutions are compared with each other, seem to depend principally upon chemical action between the solutions and the substance; but in the much more marked difference observed when we compare the dialysis of crystalloid and colloid bodies, this does not depend on any such action.

Now in a plant we have a system in which the process of nutrition is going on at both ends, the roots and the leaves of a tree; it is, however, the organic colloid substances which are manufactured in the leaves, while in most part inorganic or crystalloid compounds are absorbed by the roots. Both forms of nutriment are required at every point of the tree. The colloids have to descend, the crystalloids and water have to be raised. Constant evaporation from the leaves by maintaining "negative" pressure in the vessels greatly facilitates the rise of water from below; but the motive power is osmotic action taking place between any or every pair of cells in the chain. The "air bubbles" which form a *chapelet de Jamin* in the vessels and prevent the fall of any water previously raised by osmosis, at times when demand falls or moist air saturating the leaves supplies all water necessary from above, very possibly convert the fluid column itself into the equivalent of a porous body suitable for the action of osmosis to make itself felt between each pair of drops as they hang suspended in the vessels. The film of liquid surrounding each bubble is as a narrow space in a porous body through which the simpler and smaller groups of atoms can more readily pass than can that cumbrous collection which constitutes the physical molecule of any colloid solution. This action adapts itself exactly to the plant's requirements. Should any sap fall short at any point of water or crystalloid solution, osmotic action immediately supplies what is required from below; while the enormous pressures which dialysis can bring into play leave gravity *une quantité negligeable*. The details characterising this action as observable in conifers, as distinguished from dicotyledonous trees, will doubtless vary. The former suggest to most unbotanical minds the idea of an earlier and less highly developed type. The tracheides of a conifer act simultaneously as conducting vessels and as hollow cells in the structural framework of the trunk considered as a beam; while these purposes are more or less differentiated in the case of dicotyledonous plants. In this latter case the wood-parenchyma cells surrounding the "vessels"—filled as they are with colloid matter—appear to supplement the action of the medullary rays, not here in such close connection with conducting tracheides as they are in the case of conifers. The presence of all this colloid matter, scattered throughout the conducting mass and closely connected with the tracheides or with the fitted vessels, probably act as a reservoir and enlarge the sphere of the osmotic action, thus avoiding violent changes and preventing any very noticeable difference in sap density occurring throughout the tree's height. A gradient, however, marking difference in proportion between colloids and crystalloids must necessarily exist whenever water is rising, and this would naturally be expected to follow the introduction of these different forms of nutritive matter at opposite ends of a chain.

ELEMENTARY GEOLOGY.[1]

If a new elementary text-book of geology is really in request, no better author could be found than the president of the Geological Society of London for 1905. We venture to prefer this work to his somewhat similar "Agricultural Geology," and hope that candidates for a diploma in agriculture will now make use of both. The author, while engaged upon his task, appears to be absolutely devoid of the emotion which "nature-study" provokes in other men in various measure, and his introduction, if a little cold, should lead to accurate observation and understanding. The photographic illustrations are refreshingly large, and include successfully the forms of familiar fossils and even of flint implements. Four pins fixed in a dull white wall would, however, have served as a more satisfactory support for a helpless belemnite than the operating table and other apparatus displayed in Fig. 29. The striking relic of a Triassic land-surface, photographed by Prof. H. E. Armstrong (Fig. 27), is here reproduced, as an example of the admirable landscapes in this volume.

Our only question about the book is as to the class for whom it is intended. In the frequent absence of systematic scientific training in English schools—things are fortunately different now in Ireland—scholars may come up to our universities completely ignorant of chemistry and physics. They may also be ignorant of the animal and vegetable forms around them, and they are certain to believe that coral is a substance laboriously manufactured by an insect. We take it that, on contact with Dr. Marr and the well-known Woodwardian collections, such scholars may become attracted towards geology. Hence, in the present work, this complex subject, relying for its evidence on almost every other science, is treated as one to be laid before babes, who have never handled a blowpipe, or stroked the back of a cat to see that it possessed a spinal column. From these pages the reader may "proceed to the perusal of more advanced treatises." But what

[1] "An Introduction to Geology." By J. E. Marr, Sc.D., F.R.S. Pp. viii+230. (Cambridge: University Press, 1905.) Price 3s. net.